Magnets

D. Naples

April 10, 2010

Near Hall Subsystems

- Hydrogen/Deuterium bubble chamber (+ downstream tracker)
- Fine-grained H2O trackers
  - Straw tube (HiResMnu)
  - Scintillator-based
- LAr TPC
- Spectrometer magnet for in-situ production measurements

Magnetizing entire ND Hall has also been proposed.

Magnet Requirements

Main purpose for magnetic field:

- Beam flux determination from CC ν_μ and $\overline{\nu}_\mu$ interactions
  - Momentum analyze muon tracks that are not stopped in the fiducial detector volume.
  - Measure charge-sign for all muon tracks.

Other uses:

- Measure charge-sign of e^+/e^- tracks to constrain ν_e beam background and production models.
- Momentum analyze and measure charge of individual particles in neutrino interactions.

What drives the magnet requirements?

- Ultimately need input from beam and measurement strategy working group
  - Flux precision requirements.
  - How the flux will be measured and used.
  - How important is it to separate the components of the flux (ν_e vs. $\overline{\nu}_e$)

New or Recycled Magnets?

Two types:

- Large aperature magnet
  - Not easy to come by...
- Downstream tracker
  - Spectrometer or magnetized iron toroid

Identify existing candidate magnets.

- KTeV (more details forthcoming from D. Jensen)
  - Size : 2m gap, 2.85m wide, 3m long
  - Field up to 0.5 T
  - Availability: after E906 (should be completed before Nova shutdown in 2012 or end of 2013 at the latest)
- CERN MNP 101 Magnet (see Kevin's talk - contact?).
  - Size : 1.2m gap, 0.8m wide, 2m long
  - Field up to 1.1 T
  - Availability ?
- Others ???

Where to Start?

Needed for CDR

- Initial specs for each subsystem:
  - Required aperture size (or radius for toroids)
  - Field strength/uniformity requirements
  - Mechanical constraints
- What drives the specs.

- Devote a Tuesday meeting to this discussion (before end of April).
- Review of magnet requirements and specs ? (early July?)

Cost Estimates

- Cost of constructing UA1 magnet ($3 \times 3 \times 7\ m^3$) from scratch (quoted from G. Petrucci CERN - see R. Petti Docdb 435)

Materials	
Magnet yoke	\$2.87M
Winding	\$0.75M
Power supply	\$1.0 M
Cooling	\$0.5 M
Other	\$0.6 M
Total	\$5.7 M

(add Engineering estimate based on 25% total cost = \$1.4 M) Total Cost \$7.1M